

that the rainfall was more than the mean in all districts except Ireland N. In nearly all parts of the kingdom, except Scotland N. and Ireland S., the excess was very large. Several parts of the country recorded falls of much more than an inch within twenty-four hours, and some places more than 2 inches. Most of the heavy falls occurred either on October 15 or 16. At Lincoln (about $1\frac{1}{2}$ miles from the centre of the city) as much as 3.50 inches were recorded on October 16, and at Leith 2.61 inches on October 15, while over a large area of Great Britain measurements of between 1 inch and 2 inches were registered. The largest aggregates for the week were 4.92 inches at Bournemouth and 4.62 inches at Portland Bill.

THE report of the Government Meteorological Department on rainfall registration in Mysore for 1906 shows very clearly, both statistically and graphically, that the district average for the year was somewhat above the mean of the last thirty-seven years in all parts except in Shimoga and Mysore, but was, on the whole not sufficient to make up for the deficiency of the two previous years. The greatest rain in twenty-four hours was, as usual, at Augumbe (Shimoga), where 15 inches fell on July 21 and $11\frac{1}{4}$ inches the following day. The director, Mr. J. Cook, states that though the interest of the observers in their work has greatly increased in recent years, many of the gauges are still badly exposed.

AN interesting pamphlet by Mr. D. W. Horner, entitled "Observing and Forecasting the Weather: Meteorology without Instruments," has recently been published by Messrs. Witherby and Co., 326 High Holborn (post free, 7d.). On reading this booklet we were impressed by the fact that much useful work can be done by the public generally without expense, and with advantage to themselves, by recording their observations as recommended. The greater part of the pamphlet deals with the importance of cloud observations, and the author points out how anyone possessing an ordinary photographic camera may obtain useful pictures of clouds and lightning flashes. To make the chapter on wind more complete, a table of the velocities corresponding to estimated force by Beaufort's scale is given; the equivalents were in general use until very recently, but have been slightly modified by a publication of the Meteorological Office (No. 180, 1906) bearing upon the subject. With reference to the supposed influence of the moon on the weather, the author states that there is "grave reason for doubt" that Sir W. Herschel compiled a table until recently published in almanacs; any doubt on the question was removed by Sir J. Herschel's denial in *Good Words*, 1864.

MESSRS. SANDERS AND CROWHURST have issued a new series of lantern slides from Mr. W. Farren's photographs illustrating wild bird life, taken from nature. The slides include many instructive pictures of birds and their habits. Enlargements of the photographs are also issued.

A SECOND edition, being the third impression, of Dr. R. Wallace Stewart's "Higher Text-book of Magnetism and Electricity" has been published by Mr. W. B. Clive. This edition contains an additional chapter on the electron theory of matter and radio-activity, written by Mr. J. Satterly.

A SECOND edition, which has been revised and enlarged, of Dr. Ernst Cohen's "Vorträge für Ärzte über physikalische Chemie" has been published by Mr. W. Engelmann, of Leipzig. An authorised translation of the first edition, by Mr. M. H. Fischer, was published by Messrs.

Henry Holt and Co., of New York, in 1903, and the English version was reviewed in NATURE of July 16, 1903 (vol. lxviii., p. 245).

FROM Messrs. Philip Harris and Co., Ltd., of Birmingham, we have received a specimen of their recently introduced students' clinometer and compass. It consists of a silvered dial of some $2\frac{1}{2}$ inches diameter divided into degrees in the two uppermost quadrants, and provided with a pair of sights of the usual folding pattern. About this dial revolves a metal collar carrying a spirit level, to which is affixed an index point indicating the angular elevation of the object under measurement. No fine degree of accuracy can be expected, of course, from a dial of so small a radius, but, with the accompanying compass, the instrument should be found extremely useful in educational work, such as is involved in the practical study of physical geography, inasmuch as it will familiarise the student with the principles of the angular measurements of elevation and azimuth. The clinometer would be simpler to use, it appears to us, and would give greater accuracy, if some method were devised of attaching the collar carrying the level and index to the stand, thereby leaving the sights and dial to move independently of the latter, which could then be accurately levelled at the commencement of the observation and afterwards left undisturbed.

OUR ASTRONOMICAL COLUMN.

MELLISH'S COMET, 1907e.—A second telegram from the Kiel Centralstelle informs us that the comet discovered by Mr. Mellish at Madison on October 13 was observed by Prof. Hartwig at Bamberg on October 15. Its position at 17h. 0.4m. (Bamberg M.T.) was R.A. = 8h. 26m. 13s., dec. = $8^{\circ} 45' 16''$ S, and its magnitude 9.5.

The following are a set of elements and an ephemeris calculated by Miss Lamson from places observed on October 15, 16, and 17, and communicated by Prof. Pickering to the Kiel Centralstelle (Circular No. 100):—

Elements.

$$\begin{aligned} T &= 1907 \text{ September } 12:47 \text{ (M.T. Greenwich).} \\ \infty &= 291^{\circ} 42' \\ \Omega &= 55^{\circ} 32' \\ i &= 118^{\circ} 53' \\ q &= 0^{\circ} 973 \end{aligned} \quad \left. \begin{aligned} &1907^{\circ} \\ &= 55^{\circ} 32' \end{aligned} \right\}$$

Ephemeris 12h. (G.M.T.).

| | α | δ | Bright ness |
|------------|----------|----------|-------------|
| 1907 | | | |
| October 19 | 8 14.1 | -7 0 | 1.15 |
| " 23 | 7 57.7 | -4 38 | — |
| " 27 | 7 36.0 | -1 30 | — |
| " 31 | 7 6.8 | +2 39 | 2.06 |

The brightness at time of discovery (mag. = 9.0) is taken as unity. On October 27 the comet will be about half-way between γ (26) Monocerotis and Procyon, and on October 31 it will be some 2° north of δ (22) Monocerotis. On the latter date the comet will rise a little to the north of east at about 10.30 p.m.

A BRIGHT METEOR.—Mr. W. F. Denning informs us that a fine meteor = φ was seen by Miss Irene Warner of Horfield Common, near Bristol, on October 19 8h. 50m. It disappeared close to the star δ Aquarii, near the planet Saturn, and was directed from the north-east region of Cygnus, near α and ϵ . It was of a fiery yellow colour and formed quite a conspicuous object even in the presence of the nearly full moon.

THE SPECTRA OF SUN-SPOTS AND MIRA CETI.—In the September *Astrophysical Journal* (vol. xxvi., No. 2, p. 123) Father Cortie compares the spectra of Mira Ceti, taken at Stonyhurst during the maxima of 1897 and 1906, with the sun-spot spectrum, and infers therefrom that the temperature of the spot φ is lower than that of the photo-

sphere, thus confirming the results previously obtained by Sir Norman Lockyer, Profs. Hale and Adams, and others. There are strong reasons for believing that the spectrum-producing vapours of Mira were at a higher temperature during the 1906 than during the 1897 maximum. In the first place the star was brighter, and therefore presumably hotter. Again, the changed intensity of the hydrogen lines and of the characteristic absorption bands also indicates, according to our present knowledge, an increased temperature in 1906. Concurrently, the titan-oxide bands in the spectrum of Mira were weaker in 1906 than in 1897, and, as these bands are stronger in the spot spectrum than in that of the photosphere, it seems reasonable to conclude that the spot vapours are therefore cooler than those of the general photosphere.

The evidence thus afforded by the temperature, and the accompanying spectral changes of Mira from one maximum to a higher one agrees with Sir Norman Lockyer's temperature classification of the stars wherein similar changes, from type to type, are held to determine the relative positions of the Antarian and Aldebarian groups.

RECENTLY DISCOVERED MINOR PLANETS.—In No. 4205 (October 10) of the *Astronomische Nachrichten*, Prof. Bauschinger gives a list of thirty-four recently discovered minor planets showing the permanent designatory number that has been allotted to each. The last date of discovery given is June 9, 1907, and up to that time six hundred and thirty-five of these objects had been allotted permanent numbers. The present list also gives the provisional designation, the name of the discoverer, the date of discovery, and, where it has been allotted, the proper name by which each asteroid is to be known. A second list gives the elements for the orbit of each minor planet where they have been determined. Fifteen of these objects, which were allotted provisional numbers in 1906-7, have been found to be identical with previous discoveries.

ELEMENTS OF COMETS 1907a AND 1907d.—A set of parabolic elements for the orbit of comet 1907a is published by Signor E. Tringali in No. 4205 of the *Astronomische Nachrichten* (October 10).

The same journal also contains a set of parabolic elements for comet 1907d, calculated by Prof. E. Millosevich from observations made on June 16, July 18, and August 22. The results of a number of observations of the latter comet made at the Kremsmünster Observatory during the period July 4 to August 28 are given by Prof. F. Schwab in the same issue. On August 18 the comet was of 2.5 magnitude, and its tail was seen to extend 16° in the direction from λ to γ Geminorum.

THE LIVERPOOL ASTRONOMICAL SOCIETY.—We have received the annual report of this very active society giving a brief résumé of the work done and papers read during the session 1906-7. Among the latter, reference may be made to the president's address delivered at the opening meeting by Mr. W. E. Plummer, who, in a most interesting paper, directed attention to a few of the more urgent problems at present facing the practical and the theoretical astronomer.

An excellent photograph of Mr. George Higgs is reproduced as a frontispiece, and that observer contributes a short paper dealing with recent advances in the absolute wave-length measurements of solar radiation. Some curious phenomena were described by Mr. C. T. Whitmell, who supposed the observer to be located on the sun, and from that standpoint surveyed the solar system. Of more practical interest were the papers by the Rev. R. Killip, on the planet Jupiter; Mr. H. Waters, who presented a few notes to beginners in stellar photography; and Mr. F. W. Longbottom, on work with a 12½-inch reflecting telescope of 24-inch focus. The two last-named papers are illustrated by reproductions of photographs, that of the vicinity of γ Cassiopeiae having been taken by Mr. Waters with a 3½-inch Voigtländer portrait lens of 8 inches focal length mounted on a rough equatorial stand and driven by hand.

A MODERN SUN-DIAL.—The August number of the *Bulletin de la Société astronomique de France* (p. 360) contains an interesting illustrated description of a sun-dial which the author, Vicomte d'Arreille Montmorin, thinks may suit the modern requirements of the general public. The usual

gnomon is replaced by a wire stretched across a rectangular frame, its shadow being cast on to a semi-circular dial at the back. The frame is adjustable on pivots to any latitude, and curves engraved on the instrument give the equation of time for every fifth day. Setting screws are provided to adjust for longitude, once for all, and for the equation of time, so that no calculation is necessary, the time being read off directly from the dial, which is divided into divisions of five minutes each. The instrument is very portable, and the author suggests an ingenious arrangement of selenium cells whereby the hours and quarters might be struck on one or two gongs.

FLEAS AND PLAGUE.

SIR LAUDER BRUNTON, F.R.S., delivered the inaugural address at the opening of the twenty-fifth session of the London School of Tropical Medicine on Monday, October 25, Mr. R. L. Antrobus, C.B., Assistant Under Secretary of State for the Colonies, presiding. He described the campaign against mosquitoes in relation to malaria and yellow fever; sleeping sickness, its spread along the lines of commerce in Africa and its transmission by a tsetse fly; and then proceeded to discuss plague. The ravages of this disease in Europe in the fourteenth century under the name of the "Black Death" were described, and quotations from contemporary writers were given illustrating the terrible condition to which the countries attacked were reduced by the pestilence.

In India at the present moment the ravages of plague, though not so great as those of the Black Death or of the Great Plague in London, are nevertheless dreadful. During the first six months of this year no less than 1,060,000 deaths from plague occurred in India, and out of these 632,000 occurred in the Punjab, which has a population of only twenty-five millions, that is to say, one in every forty inhabitants in this district has died of plague between January and June.

It has long been observed that great mortality in rats is apt to precede pestilence, and Mr. Hankin suggests that the story of the Pied Piper of Hamelin is a legendary account of a plague epidemic. Simond first suggested that fleas transmitted the virus, and the most convincing experiments have been made by Captain W. Liston, I.M.S., who found that 61 per cent. of white rats and 52 per cent. of Bombay rats contracted plague from fleas which had fed upon infected rats. He then found that fleas would infect guinea-pigs. He further showed that guinea-pigs did not catch plague if they were protected from fleas in various ways, e.g. by wire gauze, adhesive fly-paper, &c. His experiments have been confirmed and extended by the Advisory Committee appointed by the Secretary of State for India, the Royal Society, and the Lister Institute, who concluded from their experiments that:—

(1) Close contact with infected animals does not give rise to plague epidemic among guinea-pigs when fleas are excluded.

(2) If fleas are present, epidemic starts at once.

(3) An epidemic may be started when no contact with a plague-infected animal is allowed, when fleas from infected animals are introduced.

(4) Infection can take place without the animal being in contact with the ground. Thus a guinea-pig put in a wire cage and suspended 2 inches from the ground contracted disease.

(5) Aërial infection did not take place if the cage was 2 feet (that is, more than fleas jump) from the ground.

(6) In all the animals thus naturally infected the large proportion, 90 per cent. (nearly), of the buboes were in the neck; 179 animals were examined, and in obtaining fleas from animals 65.3 per cent. were obtained from head and neck.

The great difficulties in the way of preventive measures are ignorance and apathy, to which superstition is often superadded. In some parts of India there is great prejudice against taking life of any kind, but this is not universal, because in some parts goats are offered to Kali, the Goddess of Destruction. If the Brahmins could per-